DETAILED ACTION

Response to Amendment

1. The changes to the drawings (received 7/8/2009) have been accepted. The objection is withdrawn.

2. The 35 USC 101 rejections have been withdrawn in view of the amendments submitted by the following examiner's amendment as a result of the phone interview 10/21/2009.

3. The 35 USC 112 rejections have been withdrawn in view of the amendments submitted by the following examiner's amendment as a result of the phone interview 10/21/2009.

EXAMINER'S AMENDMENT

4. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mark Bergner on 10/21/2009.

Examiner's Amendment

The application has been amended as follows:

Replace the previous claim listing with the attached listing.

Reasons for Allowance

5. The following is an examiner's statement of reasons for allowance:

As per independent claim 1, the closest prior art, Gersho (#5890110), Chan ("Constrained-Storage Vector Quantization in High Fidelity Audio Transform Coding"), Singh ("Multidimensional Quantizers for Scalable Video Compression") fail to teach along or in reasonable combination:

A computer system for coding and decoding digital signals by vector quantization at variable rate defining a variable resolution, comprising:

a computer readable medium storing a dictionary comprising:

codevectors of variable dimension; and

inter embedded sub-dictionaries of increasing resolution of a given dimension, wherein each sub-dictionary comprises a union of a) a first set consisting of codevectors constructed by inserting, into codevectors of dictionaries of lower dimension, elements taken from a finite set of real numbers according to a finite collection of predetermined insertion rules, and of b) a second set consisting of codevectors that may not be obtained by insertion into codevectors

of lower dimension of the elements of said finite set according to said collection of insertion rules.

Gersho is directed towards vector quantization of variable dimension, but fails to teach wherein the codebooks are embedded with increasing resolution for each dimension.

Chan is directed towards vector quantization and discloses that for variable rate encoding, embedded codebooks are used. However, Chan fails to teach variable dimension in combination with the embedded codebook.

Singh is directed to image coding which uses pyramid vector quantization (embedded resolution codebooks) for multidimensional quantization and scalability. However, Singh fails to teach the construction of the codevectors by insertion or deletion of elements by predetermined rules.

Claims 2-3 are allowable as they are dependent on and further limit claim 1.

As per independent claim 4, the closest prior art, Gersho (#5890110), Chan ("Constrained-Storage Vector Quantization in High Fidelity Audio Transform Coding"), Singh ("Multidimensional Quantizers for Scalable Video Compression") fail to teach along or in reasonable combination:

A method for operating a coding-decoding device having a processor by vector quantization at variable rate defining a variable resolution, comprising:

forming, using the processor, a dictionary comprising codevectors of variable dimension in which, for a given dimension, the method comprises:

a) forming a first set consisting of codevectors by performing an operation selected from the group consisting of inserting into and deleting from codevectors of dictionaries of dimension elements comprising at least one of lower and higher dimension elements taken from a finite set of real numbers according to a finite collection of predetermined operation rules selected from the group consisting of insertion rules and deletion rules,

b) constructing a first, intermediate, dictionary comprising at least said first set, for said given dimension, and

c) adapting said dictionary for use with at least one given resolution, wherein a second, definitive, dictionary is constructed, on the basis of the intermediate dictionary, by performing at least one of embedding and simplification of dictionaries of at least one of increasing and decreasing resolutions, the dictionaries of increasing resolutions being inter embedded from the dictionary of smallest resolution up to the dictionary of greatest resolution.

Gersho is directed towards vector quantization of variable dimension, and teaches the insertion of elements to increase dimensionality. However, Gersho fails to

teach the resolution adaptation.

Chan is directed towards vector quantization and discloses that for variable rate encoding, embedded codebooks are used. However, Chan fails to teach the development of the codebook by insertion and deletion to obtain multiple resolutions across dimensions.

Singh is directed to image coding which uses pyramid vector quantization (embedded resolution codebooks) for multidimensional quantization and scalability. However, Singh fails to teach the construction of the codevectors by insertion or deletion of elements by predetermined rules.

Claims 5, 7-14, 18-20, 23-24, 30, and 32 are allowable as they are dependent on and further limit claim 4.

As per independent claim 6, the closest prior art, Gersho (#5890110), Chan ("Constrained-Storage Vector Quantization in High Fidelity Audio Transform Coding"), Singh ("Multidimensional Quantizers for Scalable Video Compression") fail to teach along or in reasonable combination:

A method for operating a coding-decoding device having a processor by vector quantization at variable rate defining a variable resolution, comprising:

forming, using the processor, a dictionary comprising codevectors of variable dimension and, in which, for a given dimension:

a) forming a first set consisting of codevectors by performing an operation selected from the group consisting of inserting into and deleting from codevectors of dictionaries of dimension elements comprising at least one of lower and higher dimension elements taken from a finite set of real numbers according to a finite collection of predetermined operation rules,

b) constructing a first, intermediate, dictionary comprising at least said first set said given dimension,

c) adapting said dictionary for a use with at least one given resolution, wherein a second, definitive, dictionary is constructed, on the basis of the intermediate dictionary, by performing at least one of embedding and simplification of dictionaries of at least one of increasing and decreasing resolutions, the dictionaries of increasing resolutions being inter embedded from the dictionary of smallest resolution up to the dictionary of greatest resolution;

in which, for a given dimension **N**:

a'0) obtaining an initial dictionary of initial dimension **n**, higher than said given dimension **N**,

a'1) constructing a first set, of dimension **n-i**, where **i** is a non negative integer, by selecting and extracting of possible codevectors of dimension **n-i** from the dictionary of dimension **n**, according to a finite collection of predetermined deletion rules,

a'2) providing a second set consisting of codevectors of dimension **n-i**, that may not be obtained by deletion, from the codevectors of the initial dictionary, of the elements of said finite set with said collection of deletion rules,

a'3) constructing an intermediate dictionary, of dimension **n-i** comprising a union of said first set and of said second set, and

a'4) repeating steps a'1) to a'3) at most **n-N-1** times, with said intermediate dictionary in the guise of initial dictionary, down to said given dimension **N**.

Gersho is directed towards vector quantization of variable dimension, and teaches the use of a nearest neighbor algorithm to calculate the closest codevector to an input vector. Gersho also teaches variable dimensionality. However, Gersho fails to teach that the codevectors reference a correspondence table to reconstitute any codevector in a wanted dimension by referencing insertions or deletion rules along with codevectors of at least one of lower or higher dimension than the given dimension.

Chan is directed towards vector quantization and discloses that for variable rate encoding, embedded codebooks are used. However, Chan teaches this for multi-resolution, not variable dimensionality.

Singh is directed to image coding which uses pyramid vector quantization (embedded resolution codebooks) for multidimensional quantization and scalability. However, Singh fails to teach the dimensional adaptation of the codevectors by referencing a correspondence table to reconstitute any codevector in a wanted

dimension by referencing insertions or deletion rules along with codevectors of at least one of lower or higher dimension than the given dimension.

As per independent claim 15, the closest prior art, Gersho (#5890110), Chan ("Constrained-Storage Vector Quantization in High Fidelity Audio Transform Coding"), Singh ("Multidimensional Quantizers for Scalable Video Compression") fail to teach along or in reasonable combination:

A method for operating a coding-decoding device having a processor by vector quantization at variable rate defining a variable resolution, comprising:

forming, using the processor, a dictionary comprising codevectors of variable dimension in which, for a given dimension, the method comprising:

a) forming a first set consisting of codevectors by performing an operation selected from the group consisting of inserting into and deleting from codevectors of dictionaries of dimension elements comprising at least one of lower and higher dimension elements taken from a finite set of real numbers according to a finite collection of predetermined operation rules,

b) constructing a first, intermediate, dictionary comprising at least said first set, for said given dimension, and

c) adapting said dictionary to a use with at least one given resolution, wherein a second, definitive, dictionary is constructed, on the basis of the

intermediate dictionary, by performing at least one of embedding and simplification of dictionaries of at least one of increasing and decreasing resolutions, the dictionaries of increasing resolutions being inter-embedded from the dictionary of smallest resolution up to the dictionary of greatest resolution; wherein

step c) further comprises:

c0) obtaining an initial dictionary of initial resolution $\mathbf{r_n}$, lower than said given resolution $\mathbf{r_N}$,

c1) constructing on the basis of the initial dictionary, an intermediate dictionary of resolution $\mathbf{r_{n+1}}$ higher than the initial resolution $\mathbf{r_n}$, and

c2) repeating step c1) until the given resolution $\mathbf{r_N}$ is attained.

Gersho is directed towards vector quantization of variable dimension, but fails to teach wherein the codebooks are embedded with increasing resolution for each dimension.

Chan is directed towards vector quantization and discloses that for variable rate encoding, embedded codebooks are used. However, Chan fails to teach variable dimension in combination with the embedded codebook.

Singh is directed to image coding which uses pyramid vector quantization (embedded resolution codebooks) for multidimensional quantization and scalability.

However, Singh fails to teach the construction of the codevectors by insertion or deletion of elements by predetermined rules.

Claims 16-17, and 21 are allowable as they are dependent on and further limit claim 15.

As per independent claim 22, the closest prior art, Gersho (#5890110), Chan ("Constrained-Storage Vector Quantization in High Fidelity Audio Transform Coding"), Singh ("Multidimensional Quantizers for Scalable Video Compression") fail to teach along or in reasonable combination:

A method for operating a coding-decoding device having a processor, comprising:

forming, using the processor, a dictionary comprising codevectors of variable dimension in which, for a given dimension N of codevectors, the method comprises:

constructing a first, intermediate, dictionary still of dimension **N’** but of at least one of higher and lower resolution $\mathbf{r_N}$ on the basis of an initial dictionary of resolution $\mathbf{r_n}$ and of dimension **N’** by performing at least one of embedding and simplification of dictionaries of at least one of increasing and decreasing resolutions, so as to substantially attain the resolution $\mathbf{r_N}$ of said first dictionary,

forming, to attain the given dimension **N**, a first set consisting of codevectors by performing an operation selected from the group consisting of inserting into and deleting from codevectors of the first dictionary of dimension **N'** at least one of lower and higher than said given dimension **N** elements taken from a finite set of real numbers according to a finite collection of predetermined operation rules is constructed,

and subsequent to a possible step of definitive adaptation to the resolution $\mathbf{r_N}$, constructing a second, definitive, dictionary comprising at least said first set for said given dimension **N**.

As per independent claim 25, the closest prior art, Gersho (#5890110), Chan ("Constrained-Storage Vector Quantization in High Fidelity Audio Transform Coding"), Singh ("Multidimensional Quantizers for Scalable Video Compression") fail to teach along or in reasonable combination:

A method for operating a compression coding-decoding device having a processor, comprising:

searching for a codevector (x^j) which is the nearest neighbour of an input vector $y=(y_0, \ldots, y_k,\ldots, y_{j-1})$ in a dictionary (D^i_j) of given dimension (j),

reconstituting, using the processor, said codevectors by using at least one correspondence table making it possible to reconstitute any codevector of the dictionary of said given dimension, using indices of a collection of

operation rules selected from the group consisting of insertion rules and deletion rules and indices identifying elements of a set of codevectors that may not be obtained by application of the operation to codevectors of at least one of lower and higher dimension than the given dimension according to said collection of operation rules,

CO1) reconstituting, for a current index (m^j) of said codevector (x^j) sought, at least partial of a codevector of index (m') corresponding to said current index (m^j), at least through the prior reading of the indices (j', m', l_r) appearing in the correspondence tables making it possible to formulate said dictionary,

CO2) calculating at least on coding, a distance between the input vector and the codevector reconstituted in step CO1),

CO3) repeating steps CO1) and CO2), at least on coding, for all the current indices in said dictionary,

CO4) identifying, at least on coding, of the index (m_{min}) of the codevector at least partially reconstituted whose distance (d_{min}), calculated in the course of one of the iterations of step CO2), with the input vector is the smallest, and

CO5) determining at least on decoding, of the nearest neighbour of the input vector (y) in the guise of codevector (x^j) whose index (m_{min}) has been identified in step CO4).

Claims 26-29, and 31 are allowable as they are dependent on and further limit claim 25.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled “Comments on Statement of Reasons for Allowance.”

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GREG A. BORSETTI whose telephone number is (571)270-3885. The examiner can normally be reached on Monday - Thursday (8am - 5pm Eastern Time).

If attempts to reach the examiner by telephone are unsuccessful, the examiner’s supervisor, RICHEMOND DORVIL can be reached on 571-272-7602. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Greg A. Borsetti/
Examiner, Art Unit 2626

/Talivaldis Ivars Smits/ 11/12/2009
Primary Examiner, Art Unit 2626